JLAB-TN-02-008
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Bake of the vertical load lock gun

This note describes the bake out of the injector test stand load lock chamber assuming that the gun does not require a complete bake out.

Equipment and Prerequisites

Equipment Required

All the required following equipment should be found in the test cave cabinet:

1) One long heat tape, aluminum foil, heat resistant adhesive tape (wide and narrow), the bellow insulating "blanket".

2) One thermocouple is needed for the bellow, two others should already be in place on the upper VAT valve (*ie* : cross) and one on the load lock pump.

3) Three Variacs and thermocouple readers.

4) Extension cords, ground fault interrupter (yellow plug with reset), timer.

5) Stalk heater and controller.

Prerequisites

The following procedure assumes that the test cave gun is in a "ready state" to undergo a load lock bake. This means that:

- A new stalk has been installed. The bellow, supported by the Mac Allister mount, is extended to its retracted position (~ 30" from the 10" flange).
- The heating durations for the bake given in the following procedure assume that the loading of the stalk was performed quickly under Nitrogen atmosphere. If this is not the case, you may want to proceed more slowly and increase the temperature ramp time.
- The load lock chamber is isolated from the main chamber (*ie* : load lock valve closed).
- The gun (prep. chamber) has previously been completed baked and that the vacuum in the main gun chamber is good (< 0.2 uA).
- The beam line is protected from any possible accident in the main chamber (*ie* : gun valve in Shut Override mode)

The bake out procedure

The following steps need to be completed :

1) Wrap the entire bellow in an aluminum foil. Place a thermocouple near the top of the bellow, maintain with it tape. Wrap one of the long heat tape around the bellow (leaving the power plug at the bottom). **Make sure that the heat tape does not touch the thermocouple**. Finish with the " blanket". Close it tightly and maintain with large tape. The thermocouple cable will come out of the top of the blanket.

2) Plug into 3 temperature readers the areas you want to monitor:

- The upper VAT valve (cross): **1**
- The bellow: **2**
- The pump: **3**

3) Connect the 3 Variacs to the heat tapes of the

- The upper VAT valve (cross): Variac 1 ~ 75 %
- The bellow: Variac 2 ~ 65 %
- The load lock pump: Variac 3 ~ 65 %

4) Install the stalk heater, connect Nitrogen and program the bake out controller (remember that to reach 250 C on the cathode, you want the couple to be ~ 350 C):

- Ramp to 350 C in ~ 1 hour
- Soak at 350 C for 8 hours
- Cool down to 27 C ~ 2 hours.

5) Plug the Variacs, through the yellow ground fault interrupter, to the timer and set it for about 12 hours:

- Turn the timer so as to set the time in the inner circle to the present time
- Place the red part to the time you want the bake to stop
- MAKE SURE THE TIMER IS ON THE **'ON'** POSITION
- MAKE SURE TO **RESET** THE GROUND FAULT INTERRUPTER (the bake has now begun)
- Start the heat cycle of the stalk (make sure you start the Variacs and the stalk heater at the same time).

6) Make sure that the heated areas do not touch any cable, or anything. Make sure that the thermocouple cables don't touch any other cable to avoid cross-talk. Adjust the

settings of each Variac to try to keep all temperatures increasing at the same rate. The cross is the most massive part of the heated system, so the temperature rise of the cross will impose the rate for the other elements.

7) Along the bake, record the load lock ion pump current on the strip chart. Start with a large scale (on the order of 1 cm/10 min). Write down regularly the time, the 3 temperatures and the 3 Variacs settings if modified. Keep also track of the main gun ion pump current (write it down or strip chart it as well). Typical strip charts can be found in the filing cabinet in the control room.

8) As the temperature increases, you want to monitor the vacuum, *ie*: the ion pump current of the:

- Load lock pump: should not exceed 3 mA (peaks expected around 110 C and 250 C)
- Main gun pump: should not exceed ~2 uA (pressure in the gun will rise because of heat transfer).

If the load lock pump exceeds the above value, lower the settings on the Variacs. If the main gun pump rapidly spikes, turn off all Variacs: you may have created a leak.

9) Once the 3 elements have reached 250 C, make sure you adjust the Variacs settings so that all temperatures **remain stable at 250 C** (~ 75/60/60%). Check to make sure the remaining time is at least 8 hours on the Variacs timer AND ON THE STALK HEAT CONTROLLER. Reduce speed of the strip chart recorder (1"/hour). Go home.

10) The next morning as you come in, the bake should be over and all temperatures should be close to room temperature. Write down date, time and ion pump current on the strip chart before you stop it. Both pumps should close to zero (< 0.2 uA). Unplug everything, unwrap the bellow.

11) By now, both the load lock and the main gun chambers should have good vacuum. Run an RGA **load lock valve closed** and save it (MMDD_lst.rga). Then slowly open the load lock valve while watching the main gun ion pump current. Look for any difference in the RGA trace, save it (MMDD_tt.rga).

12) While monitoring the ion pump currents, slowly close the valve to the load lock pump. If vacuum conditions remain unchanged, unplug the pump.